IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF PENNSYLVANIA

Hartle et al.,
Plaintiffs,
v. Civil Action No. 08-1019
FirstEnergy Generation Corp.,
Defendant.

Patrick et al.,
Plaintiffs,
v. Civil Action No. 08-1025
FirstEnergy Generation Corp.,
Defendant.

Price et al.,
Plaintiffs,
v. Civil Action No. 08-1030
FirstEnergy Generation Corp.,
Defendant.

MEMORANDUM OPINION

CONTI, Chief District Judge

I. Introduction

Before the court are expert challenges in three cases consolidated for discovery, *Hartle v. FirstEnergy Generation Corp.* (No. 08-1019), *Patrick v. FirstEnergy Generation Corp.* (No. 08-1025), and *Price v. FirstEnergy Generation Corp.* (No. 08-1030). These cases involve the Bruce Mansfield Power Plant ("Bruce Mansfield"), a coal-fired electric generating facility located along the Ohio River in Shippingport, Pennsylvania. Bruce Mansfield is owned and operated by defendant FirstEnergy Generation Corporation ("FirstEnergy" or "defendant"). The plaintiffs allege harm from air pollution discharged by Bruce Mansfield. The alleged pollution came in the form of "white rain," a chronically discharged corrosive material, and "black rain," a

dark-colored sooty residue discharged on two occasions in 2006 and 2007. The white rain and black rain were deposited on the area surrounding Bruce Mansfield, allegedly causing property damage and adverse health effects. The plaintiffs in *Hartle* are two parents seeking damages for adverse health effects sustained by their minor daughter. The named plaintiffs in *Patrick* are four couples who make class-action claims for damages due to diminution of property value and seek to enjoin the plant from operating until it can prevent the white rain emissions. In *Price*, nineteen plaintiffs seek monetary damages for adverse health effects and property damage and seek injunctive relief.

The parties conducted extensive fact and expert discovery in these cases. Defendant filed motions to limit or preclude the testimony of twelve of plaintiffs' experts. Plaintiffs filed motions to limit or preclude the testimony of seven of defendant's experts. This memorandum opinion addresses the parties' air modeling experts—Ronald Petersen, PhD ("Petersen"), Peter J. Drivas, PhD ("Drivas"), and Nicholas Cheremisinoff, PhD ("Cheremisinoff").[1] The motions to exclude these experts are fully briefed, and the court heard testimony and argument on January 13, 2014.

II. Legal Standards

Federal Rule of Evidence 702 governs the admissibility of expert testimony and states:

> A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

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1 The motions to preclude the opinions of Petersen are ECF No. 173 (*Patrick*) and ECF No. 130 (*Price*). The motions to limit the opinions of Drivas are ECF No. 112 (*Hartle*), ECF No. 212 (*Patrick*), and ECF No. 91 (*Price*). The motions to preclude the opinions of Cheremisinoff are ECF No. 162 (*Patrick*) and ECF No. 109 (*Price*). Unless otherwise noted, ECF numbers appearing in the text of this opinion refer to the *Patrick* case, No. 08-1025.

(a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;

(b) the testimony is based on sufficient facts or data;

(c) the testimony is the product of reliable principles and methods; and

(d) the expert has reliably applied the principles and methods to the facts of the case.

FED. R. EVID. 702. Under the seminal case of *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), district courts must act as gatekeepers to "ensure that any and all scientific testimony or evidence admitted is … reliable."[2] *Id.* at 589. The United States Court of Appeals for the Third Circuit explained that Rule 702 "embodies a trilogy of restrictions" that expert testimony must meet for admissibility: qualification, reliability and fit. *Schneider ex rel. Estate of Schneider v. Fried,* 320 F.3d 396, 404 (3d Cir. 2003). The party offering the expert testimony has the burden of establishing each of these requirements by a preponderance of the evidence. *In re TMI Litig.,* 193 F.3d 613, 663 (3d Cir. 1999).

A. Qualification

An expert witness's qualification stems from his or her "knowledge, skill, experience, training, or education." FED. R. EVID. 702. The witness therefore must have "specialized expertise." *Schneider*, 320 F.3d at 405. The court of appeals interprets the qualification requirement "'liberally,' holding that 'a broad range of knowledge, skills, and training qualify an expert as such.'" *Calhoun v. Yamaha Motor Corp., U.S.A.*, 350 F.3d 316, 321 (3d Cir. 2003) (quoting *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 741 (3d Cir. 1994)). When evaluating an expert's qualifications, district courts should not insist on a certain kind of degree or background. *Robinson*

2 While *Daubert* applied exclusively to scientific testimony, *see Daubert*, 509 U.S. at 590 n.8, the Supreme Court subsequently extended the district court's gatekeeper function to all expert testimony. *Kuhmo Tire Co. v. Carmichael*, 526 U.S. 137, 147 (1999).

v. Hartzell Propeller Inc., 326 F. Supp. 2d 631, 667 (E.D. Pa. 2004). An expert's qualifications are determined with respect to each matter addressed in the proposed testimony. *Calhoun*, 350 F.3d at 322 ("An expert may be generally qualified but may lack qualifications to testify outside his area of expertise."). "While the background, education, and training may provide an expert with general knowledge to testify about general matters, more specific knowledge is required to support more specific opinions." *Id.*

B. Reliability

In *Daubert*, the Supreme Court stated that the district court's gatekeeper role requires "a preliminary assessment of whether the reasoning or methodology underlying the testimony is … valid and of whether the reasoning or methodology properly can be applied to the facts in issue." *Daubert*, 509 U.S. at 592–93. While the Court noted in *Daubert* that district courts were permitted to undertake a flexible inquiry into the admissibility of expert testimony under Rule 702, the court of appeals has enumerated the following eight factors that a district court may examine:

1. whether a method consists of a testable hypothesis;
2. whether the method has been subjected to peer review;
3. the known or potential rate of error;
4. the existence and maintenance of standards controlling the technique's operation;
5. whether the method is generally accepted;
6. the relationship of the technique to methods which have been established to be reliable;
7. the qualifications of the expert witness testifying based on the methodology; and
8. the non-judicial uses to which the method has been put.

In re Paoli R.R Yard PCB Litigation , 35 F.3d 717, 742 n.8 (3d Cir. 1994) ("*Paoli II*"). This list of factors is a "convenient starting point," but is "neither exhaustive nor

applicable in every case." *Kannankeril v. Terminix Int'l, Inc.*, 128 F.3d 802, 806–07 (3d Cir. 1997).

Under these factors, experts are not permitted to engage in a "haphazard, intuitive inquiry," but must explain the research and methodology they employed in sufficient detail in order to allow the other party's expert to test that hypothesis. *Oddi v. Ford Motor Co.*, 234 F.3d 136, 156 (3d Cir. 2000). Where an expert fails to use standards to control his or her analysis, "no 'gatekeeper' can assess the relationship of [the expert's] method to other methods known to be reliable and the non-judicial uses to which it has been put." *Id.* at 158.

"The evidentiary requirement of reliability is lower than the merits standard of correctness." *Paoli II,* 35 F.3d at 744. "As long as an expert's scientific testimony rests upon 'good grounds, based on what is known,' it should be tested by the adversary process—competing expert testimony and active cross-examination—rather than excluded from jurors' scrutiny for fear that they will not grasp its complexities or satisfactorily weigh its inadequacies." *United States v. Mitchell,* 365 F.3d 215, 244 (3d Cir. 2004) (quoting *Ruiz-Troche v. Pepsi Cola of P.R. Bottling Co.,* 161 F.3d 77, 85 (1st Cir. 1998)).

C. Fit

The Rule 702 requirement that testimony "help the trier of fact to understand the evidence or to determine a fact in issue" is called the "fit" requirement. Fit requires that there be a "connection between the scientific research or test result to be presented and particular disputed factual issues in the case." *Paoli II*, 35 F.3d at 743. "'Fit is not always obvious, and scientific validity for one purpose is not necessarily scientific validity for other, unrelated purposes.'" *Id.* (quoting *Daubert*, 509 U.S. at 591). The standard for fit is "not that high," although it is "higher than bare relevance." *Id.* at 745.

III. Discussion

Two of the key issues in these cases are the extent of the area affected by the white rain and the two black rain events and the amount of material deposited by those events. The parties seek to introduce air modeling experts to opine about these issues. In calculating the dispersion and deposition of emissions from the white and black rain events, plaintiffs' expert Petersen primarily relied on a model called "AERMOD." Defendant argues Petersen's white rain opinions are unreliable because AERMOD is not an appropriate model for measuring liquid stack discharge and because Petersen made faulty assumptions in applying the model, among other reasons. Defendant's expert Drivas used a model called "AGDISP" for his calculations. Plaintiffs argue that AGDISP, which was designed for agricultural applications such as crop dusting, is not scientifically reliable.

As set forth below, the court concludes that, while neither AERMOD nor AGDISP is perfectly tailored to the white rain issue, the parties' arguments with respect to Petersen and Drivas go to weight, not admissibility. Which of the competing models better reflects the facts of these cases is a matter for the jury to decide. *See In re TMI Litig.*, 193 F.3d at 682 ("In a *Daubert/Paoli II* analysis, the focus is not on determining 'which of several competing scientific theories has the best provenance.'" (quoting *Ruiz-Troche v. Pepsi Cola of P.R. Bottling Co.*, 161 F.3d 77, 85 (1st Cir. 1998))). The white rain opinions of Petersen and Drivas are based on valid reasoning and methodologies.

The court finds that Petersen's breathing zone and black rain opinions also meet the requirements for admissibility under Rule 702. The motions to exclude the expert testimony Petersen and Drivas will be denied. The motions to exclude the expert testimony of Cheremisinoff will be granted, as he merely vouches for Petersen and his opinions are needlessly cumulative.

A. Defendant's Motions to Preclude the Expert Opinions of Petersen

1. Petersen's Expert Reports and Motion to Strike Supplemental Report

Petersen prepared three primary expert reports in August 2012: "Assessment of White Rain Deposition Around the Bruce Mansfield Plant" ("Petersen White Rain Rep."), "Assessment of Black Rain Deposition Around the Bruce Mansfield Plant" ("Petersen Black Rain Rep."), and "Summary Report on the Breathing Zone Air Quality Impacts" ("Petersen Breathing Zone Rep."). Petersen filed a supplemental expert report entitled "Response to Drivas Expert Reports" in November 2012 ("Petersen 2012 Rebuttal Rep.") and filed an additional report in May 2013, "Response to Dr. Peter J. Drivas Expert Report 6" ("Petersen 2013 Rebuttal Rep."). Finally, on January 3, 2014, Petersen submitted a "Refined Assessment of White Rain Deposition Around the Bruce Mansfield Plant." Defendant moved to strike the last report as untimely and prejudicial (ECF No. 262). As a preliminary matter, the court will deny the motion to strike.

Petersen's 2014 report was submitted over a year after the court's deadline for supplemental expert reports, October 15, 2012. (ECF No. 101.) The court has broad discretion to enforce its discovery case management orders and may exclude untimely expert reports under Rule 37 of the Federal Rules of Civil Procedure. *See In re TMI Litig.*, 193 F.3d at 722 (affirming district court's exclusion of expert reports persistently filed late in "flagrant violation of pre-trial orders"). The court of appeals enumerated several factors for courts to consider when evaluating whether to exclude evidence under Rule 37:

> "(1) the prejudice or surprise in fact of the party against whom the excluded witnesses would have testified, (2) the ability of that party to cure the prejudice, (3) the extent to which waiver of the rule against calling unlisted witnesses would disrupt the orderly and efficient trial of the case or of other cases in the court, and (4) bad faith or willfulness in failing to comply with the district court's order."

Id. at 721 (quoting *Meyers v. Pennypack Woods Home Ownership Ass'n*, 559 F.2d 904–05 (3d Cir. 1977)).

After applying these factors to the instant case, the court concludes that the 2014 supplemental report should not be excluded at this stage. Based upon plaintiffs' representation that the report contains only "minor change[s] for the purpose of improved accuracy," the court finds that the prejudice to the defendant is low. (ECF No. 266, at 6.) The court does not find bad faith by plaintiffs. Parties have a duty to supplement their expert reports, both under the Rules of Civil Procedure and the dictates of sound scientific practice. FED. R. CIV. P. 26(e)(2). Rule 26 does not give parties the right to freely supplement, especially after court-imposed deadlines. "'Courts distinguish "true supplementation" (e.g., correcting inadvertent errors or omissions) from gamesmanship, and have therefore repeatedly rejected attempts to avert summary judgment by "supplementing" an expert report with a "new and improved" expert report.'" CHARLES ALAN WRIGHT, ARTHUR R. MILLER & RICHARD L. MARCUS, FEDERAL PRACTICE AND PROCEDURE § 2049.1 (quoting *Gallagher v. S. Source Packaging, LLC*, 568 F. Supp. 2d 624, 631 (E.D.N.C. 2008)). Plaintiffs, however, do not appear to be engaged in gamesmanship. The supplement is based upon the same methods and corrects minor errors. Although Petersen's second rebuttal report was also untimely, plaintiffs otherwise adhered to expert discovery deadlines.

Defendant has the opportunity to cure any prejudice. The 2014 supplement was not before the court at the *Daubert* hearing on January 13, 2014, and this opinion does not address the supplement with respect to any Rule 702 issues. Should defendant feel that the supplement implicates admissibility issues not resolved by the remainder of this opinion, the court will afford defendant the opportunity until April 7, 2014, to raise those issues in a supplemental *Daubert* motion. If that motion is filed, the court will schedule briefing and a hearing on an expedited basis.

Defendant's motion to strike the supplemental report will be denied. No further supplementation will be permitted without a compelling justification. *See Beller ex rel.*

Beller v. United States, 221 F.R.D. 696, 701 (D.N.M. 2003) (refusing to "create a system where preliminary reports could be followed by supplementary reports and there would be no finality to expert reports, as each side, in order to buttress its case or position, could 'supplement' existing reports and modify opinions previously given").

2. White Rain Opinions

Petersen modeled the extent of the deposition of white rain on the area surrounding Bruce Mansfield by using AERMOD. (Petersen White Rain Rep., at iii, ECF No. 175-2.) AERMOD is the model preferred by the U.S. Environmental Protection Agency ("EPA") for regulatory air dispersion modeling. (*Id.* at 5.) To predict white rain deposition, Petersen entered inputs for emission rates, droplet size, stack flow rate and temperature, and meteorological conditions. (*Id.* at 1.) Petersen ran the model under three different operating scenarios to reflect changes to the plant over time. (*Id.* at 2.) For each of the three scenarios, Petersen produced maps with contour lines outlining areas where white rain was deposited at a given level. Petersen mapped deposition for several time periods: total annual deposition, maximum twenty-four-hour deposition, and maximum one-hour deposition.

Petersen filed a supplemental report in response to criticism from defendant's expert Drivas. Drivas criticized AERMOD because it was designed for dry particulates gasses and does not adequately account for evaporation when applied to wet droplets as in this case. (Hr'g Tr. 187:15–188:9, Jan. 13, 2014, ECF No. 275.) To simulate evaporation under different meteorological conditions, Petersen reran AERMOD assuming no evaporation and assuming fifty percent evaporation. (Petersen 2012 Rebuttal Rep. 16, ECF No. 242-2.) Petersen corroborated the accuracy of his updated predictions by using AGDISP and an additional model, "SACTI." (*Id.* at 12–14, 17.) In his 2013 rebuttal report, Petersen refined his predictions by running the model for meteorological conditions of twenty-five percent or less evaporation. (Petersen 2013 Rebuttal Rep. 4, ECF No. 175-11.)

Defendant challenges the reliability of Petersen's white rain opinions on five grounds: (1) Petersen's models fail to account for evaporation; (2) Petersen's one-hour maximum deposition failed to account for actual meteorological conditions; (3) the SACTI model is unreliable; (4) Petersen did not validate his results by comparing them to actual field observation; and (5) the models have an error rate of 50 to 200 percent.

AERMOD does not model evaporation, but Petersen altered input parameters to model dispersion under various evaporation conditions. Petersen used the AGDISP model to determine the number of hours from 2005 to 2007 during which evaporation was less than 50 percent. (Hr'g Tr. 103:23–104:9, Jan. 13, 2014, ECF No. 275.) His revised updated model excluded all hours during the three-year period in which evaporation was more than 50 percent—that is, Petersen assumed that no material was deposited during those hours. (*Id.* at 114:25–115:4.)

AERMOD is widely accepted for modeling the dispersion of dry particulate and gasses. Petersen made some modifications to account for evaporation. In the court's view, these adaptations do not change the fundamental soundness of the AERMOD methodology. *See Paoli II*, 35 F.3d at 745 n.14 ("[I]f a court finds that an expert has employed a methodology only slightly different from a methodology that the court thinks is clearly reliable, the court should be more likely to accept the altered methodology than if it was evaluating that methodology as an original matter."). While defendant may quarrel with the accuracy of Petersen's handling of evaporation, this goes to credibility or weight, not admissibility. *See id.* at 744 ("The judge might think that there are good grounds for an expert's conclusion … even if the judge thinks that a scientist's methodology has some flaws such that if they had been corrected, the scientist would have reached a different result.")

Defendant argues that Petersen's models did not account for actual meteorological conditions. The court is unpersuaded by this argument. Petersen considered meteorological data in his rebuttal reports. After examining

meteorological data, Petersen determined the number of hours when there would be zero evaporation (about 3 percent of the time) and the number of hours when the evaporation rate would be 50 percent or less (about 11 percent of the time). (Hr'g Tr. 101:2–6, 112:24–113:12, Jan. 13, 2014, ECF No. 275.) Again, flaws in Petersen's handling of meteorological data can be addressed through cross-examination and the testimony of opposing experts.

Defendant argues that the SACTI model used by Petersen is unreliable because the model does not predict any white rain deposition within one-half mile of Bruce Mansfield, which is contradicted by the testimony of numerous witnesses. (ECF No. 174, at 8.) Petersen used SACTI to validate AERMOD and show that wet droplets would travel further than shown by Drivas's AGDISP model. (Petersen 2013 Rebuttal Rep. 21, ECF No. 175-11.) Petersen did not intend for SACTI to accurately model white rain deposition, only to demonstrate that AERMOD is the preferred model. (ECF No. 242, at 12.) Should Petersen testify about the SACTI model, the court will instruct the jury that the SACTI model is only to be used to compare AERMOD and AGDISP and is not evidence of where white rain was actually deposited.

Defendant argues that Petersen failed to validate his modeling results by comparing them to field observations. (ECF No. 174, at 11.) Petersen, however, did consider field observations. (*See* Petersen 2013 Rebuttal Rep. 6–7 figs.1–3 (overlaying the model's contours with maps of locations with reported white rain deposition for the three emission scenarios).) To the extent that the other field observations are inconsistent with Petersen's predictions, that evidence goes to weight, not admissibility. The court does not find a serious methodological flaw with respect to defendant's argument the Petersen failed to validate his model because he compared his results to field observations.

With respect to the error rate of the model, Petersen admitted that the error rate of AERMOD was a factor of two. (Hr'g Tr. 130:11–15, Jan. 13, 2014, ECF No. 275.) He testified that this is the generally accepted error rate for air dispersion modeling. (*Id.*)

The AGDISP model preferred by defendant also has an error rate of a factor of two. (Cheremisinoff Rep. 17–18, ECF No. 165-1.) As AERMOD is widely accepted for legal and nonlegal air modeling applications, AERMOD's error rate does not preclude its use in this case. *See* Revision to the Guideline on Air Quality Models, 70 Fed. Reg. 68,218, 68,220 (Nov. 9, 2005) (recommending AERMOD as a "state-of-the-science" air dispersion model after "extensive, independent peer review" and performance evaluations).

Defendant also attacks Petersen's white rain opinions on "fit" and helpfulness grounds. Defendant argues that (1) Petersen failed to consider the frequency of white rain, (2) the one-hour maximums will distract jurors from the actual visible evidence, and (3) Petersen's different models and scenarios are too uncertain to be helpful. None of these arguments persuades the court that Petersen's testimony should be excluded.

Plaintiffs admit that Petersen did not consider the frequency of white rain deposition, but argue that his testimony is "a piece of the puzzle" that will "significantly assist the trier of fact." (ECF No. 242, at 15.) Unlike the opinions of Wayne Isphording ("Isphording") and James Millette ("Millette"), which the court excluded on "fit" and helpfulness grounds, Petersen's white rain opinions are limited to the timeframe at issue in these cases. In excluding the expert testimony of Isphording and Millette, the court noted that whether fly ash particles from Bruce Mansfield were deposited on plaintiffs' properties was not a disputed issue—and should defendant dispute it at trial, plaintiffs could seek to present the testimony of Isphording and Millette. (ECF No. 278, at 9 n.6, 10 n.7.) While defendant admits that white rain has occurred intermittently within a half-mile of Bruce Mansfield, defendant disputes the allegation that white rain has fallen on plaintiffs' properties. (Hr. Tr. 168:21–169:14, Jan. 13, 2013, ECF No. 275.) Because there is a connection between Petersen's white rain opinions and a disputed issue in the cases, his testimony satisfies the "fit" requirement.

Defendant argues that due to the "inherent rate of error" in air modeling and the various scenarios presented by Petersen, Petersen's white rain opinions will not assist the trier of fact. (ECF No. 174, at 15–16.) Specifically, defendant argues that the "model showing maximum one-hour hypothetical deposition … is intended to distract the trier of fact from reliable evidence of 'white rain' deposition, without adding any helpful information." (*Id.* at 15.) The court does not view the air models as distracting or misleading. Defendant will have the opportunity to bring the error rate and other limitations of the models to the jury's attention, and the jury will be able to weigh the expert testimony in the context of the entirety of the evidence presented at trial.

Defendant relies on *LaBauve v. Olin Corp.*, 231 F.R.D. 632 (S.D. Ala. 2005), for the proposition that air modeling with a high error rate should be excluded as unhelpful. This reliance is misplaced. The district court in *LaBauve* held, in ruling on a motion for class certification, that air modeling data showing that plaintiffs' properties received contamination from 1957 to 1971 (thirty-five to fifty years prior to the relevant time period) was insufficient to establish a present injury in fact or standing. *Id.* at 647–48. This situation significantly differs from Petersen's models. Petersen used meteorological data from 2005 to 2007 and predicted deposition during this period, which is relevant to the claims in these cases. Additionally, for the purposes of the Rule 23 motion, the court in *LaBauve* accepted the air model as "a scientifically valid tool for estimating" the dispersion of the airborne contaminants at issue in that case. *Id.* at 648.

During oral argument, defendant cited a recent decision from the Southern District of West Virginia, *Coleman v. Union Carbide Corp,* Civil No. 11-366, 2013 WL 5461855 (S.D. W. Va. Sept. 30, 2013), in support of the argument that use of maximum emission estimates affects the reliability of air modeling opinions. (Hr'g Tr. 73:21–74:12, Jan. 14, 2014, ECF No. 276.) The excluded air modeler in *Coleman* assumed that "the facility operates continuously at its maximum capacity under

worst-case operating conditions," rather than what the plant was actually emitting. *Coleman*, 2013 WL 5461855, at *25 n.11 (internal quotation marks omitted). The court in *Coleman* noted:

> [The air modeling expert's] approach of using maximum, not actual, emissions is apparently rooted in his permit-based modeling method previously deemed unhelpful. He has emission sources borrowing data from one another, across many years, and then combining them with the unexplained assumption that the target maximum emission rates all occurred in the same year.

Id. at *25. The *Coleman* case differs significantly from the cases at bar. Petersen did not assume a constant maximum emission rate. He determined the maximum single-hour deposition during the three-year period he examined. Petersen testified that maximum hourly concentration is a typical way of measuring air pollution. (Hr'g Tr. 156:17–157:8, Jan. 13, 2014, ECF No. 275.)

Defendant asserts that Petersen provides "at least seventeen" sets of modeling results. (ECF No. 174, at 17.) These different models, defendant argues, are likely to confuse the trier of fact. (*Id.* at 18.) When asked which of his models is correct, Petersen explained that each was accurate, just based on a different set of factual assumptions. (Hr'g Tr. 71:11–21, Jan. 14, 2014, ECF No. 276.) This situation is not one where the expert lacks sufficient certainty to make a professional judgment. *Cf. Schulz v. Celotex Corp.*, 942 F.2d 204, 209 (3d Cir. 1991). After the jury determines the actual facts, it can evaluate which of Petersen's models, if any, should be accorded evidentiary weight.

The court concludes that Petersen's white rain opinions meet the requirements for admissibility under Rule 702.

3. Black Rain Model

Petersen used AERMOD to model the extent of the deposition of material emitted in the black rain events on July 22, 2006, and June 10, 2007. Petersen mapped the contours of what he identified as each event's "impact zone." (Petersen Black Rain

Rep., at iii, ECF No. 175-32.) Defendant argues that Petersen's black rain opinion should be precluded to the extent he is offering an opinion that soot deposition affected every property within the impact zone because "[n]o mathematical model can predict with total accuracy the deposition on each individual property." (ECF No. 174, at 24.) Defendant points out that of the twenty-nine plaintiffs residing within the 2006 event impact zone, three testified that they did not observe soot and of the seventeen plaintiffs residing within the 2007 event impact zone, three testified that they did not observe soot. (*Id.* at 24–25.)

The question whether Petersen's black rain opinion alone—that is, without testimony from fact witnesses who observed soot on a property—would constitute sufficient evidence to prove nuisance or trespass is not currently before the court. The questions the court must answer are whether the opinion is based upon valid methods or reasoning and whether it would be helpful to the trier of fact. As the court indicated on the record at the *Daubert* hearing, Petersen's black rain opinion meets both criteria and is admissible. (Hr'g Tr. 96:2–25, Jan. 14, 2014, ECF No. 276.)

With respect to reliability, the court notes that Petersen's contours for the 2006 event are consistent with those of defendant's expert, Drivas. (*Id.* 6:1–8.) Drivas disagreed with Petersen's 2007 event contours, but this disagreement is based on a factual dispute about the length of the time Bruce Mansfield was emitting black rain, not any methodological difference. (*Id.* at 5:10–6:10.) Drivas agreed that Petersen's use of AERMOD is appropriate for modeling the black rain events because the black rain consisted of oily droplets, which do not evaporate. (*Id.* at 6:11–15.)

The black rain modeling is relevant to a contested issue of fact in these cases. Whether or not the model can sustain the plaintiffs' burden of proof in the absence of other evidence, the model will help the jury by corroborate or contradict other evidence—that is, it would tend to make facts of consequence more or less probable than it would be without the evidence. Fed. R. Evid. 401. Although Rule 702's "fit" standard is higher than "bare relevance," the standard is "not that high." *See Paoli II*,

35 F.3d at 745 ("For example, in *Paoli I*, we held that testimony that PCBs cause liver cancer 'fit' the case even in the absence of plaintiffs who had liver cancer, because an expert's affidavit suggested that increased risk of liver cancer was probative of increased risk of other forms of cancer. *See Paoli I*, 916 F.2d [829,] 858 [3d Cir. 1990]."). Petersen's black rain modeling meets that standard.

4. Breathing Zone Model

Petersen used AERMOD to estimate the concentration of particulates due to emissions from Bruce Mansfield at plaintiffs' properties. For two emissions scenarios, Petersen modeled the concentrations of PM_{10}, $PM_{2.5}$, and arsenic.[3] Scenario one relied upon emissions data from testing done in 1998. Scenario two relied upon data from stack tests in 2012. Defendant does not challenge the applicability of AERMOD to modeling these dry particulates. Defendant challenges the reliability of the scenario one breathing zone model on two grounds: (1) Petersen overstated the total amount of particulate emitted from Bruce Mansfield; and (2) Petersen applied an erroneous mass fraction, leading him to overestimate the amount of arsenic and other metals in the emitted particulate.[4] (ECF No. 174, at 19.)

Petersen's data on the total amount of particulate emitted by Bruce Mansfield was derived from a test known as "Method 17." The Method 17 test is not approved by the EPA for measuring particulate matter from saturated or wet stacks like those at Bruce Mansfield during the applicable period. 40 C.F.R. pt. 60 app. A-6 (Method 17 § 1.2) ("This method is not applicable to stacks that contain liquid droplets or are saturated with water vapor."). The Method 17 test on the Bruce Mansfield stacks was performed in 1998 by Radian, a firm hired by defendant. Plaintiffs assert that

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3 PM_{10} is particulate matter less than 10 micrometers in diameter. $PM_{2.5}$ is fine particulate matter less than 2.5 micrometers in diameters. (*See* Hr'g Tr. 197:19–22, Jan. 13, 2014, ECF No. 275.)

4 The scenario two breathing zone model is not being challenged by defendant. (Hr'g Tr. 149:19–22, Jan. 13, 2014, ECF No. 275.)

defendant turned this stack particulate data over to them in discovery, previously relied upon the data in regulatory filings, and never objected to the reliability of the data until the instant *Daubert* motion. (ECF No. 242, at 17.) Defendant asserts that it made available to plaintiffs data from tests conducted in 1995, 2007, and 2009 using the EPA-approved methodology for measuring particulate from wet stacks. (ECF No. 174, at 20 & n.17.)

That Method 17 is not EPA-approved for measuring particulate from stacks with liquid droplets is evidence that it may not be the best testing protocol, but *Daubert* does not require the "best" methodology or data. *Paoli II*, 35 F.3d at 744 ("The grounds for the expert's opinion merely have to be good, they do not have to be perfect."). The EPA's use of a different test for regulatory purposes does not necessarily mean that Method 17 is unreliable when used on saturated stacks. Petersen testified that he examined the 1995 study, which used the EPA-approved method, and found that the particulate emission rate "agreed quite well" with what he found using data from the 1998 Method 17 study. (Hr'g Tr. 161:10–20, Jan. 13, 2014, ECF No. 275.) The court will not exclude Petersen's scenario one breathing zone model on this basis.

Defendant argues that Petersen inappropriately applied mass fractions when determining the amount of metals in the particulate. (*Id.* at 22.) Particulate matter is composed of condensable particulate, which is mostly gaseous while in the stack and has little metal content, and filterable particulates, which are larger and can be trapped by filters. (*Id.* at 21.) Defendant contends that Petersen used a mass fraction for arsenic—that is, the ratio of the metal to the total particulate—derived only from filterable particulate. (*Id.* at 22.) Petersen applied those filterable particulate mass fractions to the total mass of particulates, which included the condensable particulates. (*Id.* at 23.) The condensable particulate was about 90 percent sulfates, which contain no arsenic. (*Id.*; Hr'g Tr. 151:7–152:9, Jan. 13, 2014, ECF No. 275.)

Defendant argues that this calculation resulted in overestimating the arsenic in the breathing zone model by about a factor of ten. (ECF No. 174, at 23.)

The disagreement between Petersen and Drivas appears to be how they interpreted the data from the 1998 Radian test and the 2012 test. (Hr'g Tr. 100:7–21, Jan. 14, 2014, ECF No. 276.) In Petersen's view, 90 percent of the total particulate was sulfuric acid or sulfates, not 90 percent of the condensable particulate. (*Id.* at 100:10–14.) Petersen found no differentiation in the reports between how much of the sulfates was filterable particulate and how much was condensable particulate. (*Id.* at 100:14–17.) He testified that "there's no reason not to assume that the mass fraction of arsenic would be the same in all particulate, total, condensibles plus filterables." (Hr'g Tr. 126:15–17, Jan. 13, 2014, ECF No. 275.)

From the briefing, testimony, and argument, the court cannot determine which expert's interpretation of the data and application of the mass fraction is correct. The court's role, however, is not to determine which expert is correct. The jury should be permitted to hear the testimony and determine which expert's opinion is entitled to more weight. *Paoli II*, 35 F.3d at 744–45 ("A judge frequently should find an expert's methodology helpful even when the judge thinks that the expert's technique has flaws sufficient to render the conclusions inaccurate. He or she will often still believe that hearing the expert's testimony and assessing its flaws was an important part of assessing what conclusion was correct and may certainly still believe that a jury attempting to reach an accurate result should consider the evidence.").

B. Plaintiffs' Motions to Limit the Expert Testimony of Drivas

Defendant's air modeling expert, Drivas, prepared several expert reports responding to Petersen's reports. Drivas concluded that AERMOD is inappropriate for measuring white rain deposition because the model does not properly account for evaporation. (Drivas Rep. No. 4, at 4, ECF No. 232-1.) Drivas instead applied the AGDISP model, which was developed to model airborne spraying of pesticide. (*Id.*) Using AGDISP, Drivas calculated that over 95 percent of water droplets released from

the Bruce Mansfield stacks will evaporate in the air and that almost all droplet deposition occurs within 1,500 feet of the stack. (*Id.* at 7, 8.) At a distance of one-half mile from the stacks, less than 2 percent of released water droplets remain aloft. (*Id.* at 10 tbl.4.1.) AGDISP predicted that these remaining droplets evaporate in less than ten seconds, leading to no deposition beyond one-half mile from the stacks. (*Id.* at 11.)

Plaintiffs argue that AGDISP is not a reliable methodology for measuring white rain deposition and seek to preclude Drivas from testifying about the AGDISP model or his results. Plaintiffs assert that, since the EPA recommends AERMOD for predicting air dispersion from power plants, AERMOD should be deemed reliable and AGDISP should be deemed inadmissible. (ECF No. 113, at 10.)[5] Plaintiffs argue that, under the EPA Guideline on Air Quality Models ("EPA guideline"), a model not on the EPA's preferred list can only be used in certain circumstances.[6] (*Id.* at 11.) AGDISP does not satisfy those criteria because it "is not used and has never been approved for use in modeling wet stack emissions from a stationary smoke stack." (*Id.* at 12.)

The EPA guideline applies to "the application of air quality models for regulatory purposes." 40 C.F.R. pt. 51 app. W (preface). Nothing in the EPA guideline

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5 Because plaintiffs' memorandum of law in support of their *Daubert* motion to limit the testimony of Drivas was not filed on the *Patrick* docket, the ECF number refers to the *Hartle* case.

6 The EPA guideline permits the use of alternative models in the following circumstances:

> (1) If a demonstration can be made that the model produces concentration estimates equivalent to the estimates obtained using a preferred model; (2) if a statistical performance evaluation has been conducted using measured air quality data and the results of that evaluation indicate the alternative model performs better for the given application than a comparable model in Appendix A; or (3) if the preferred model is less appropriate for the specific application, or there is no preferred model.

40 C.F.R. pt. 51 app. W § 3.2.2(b).

suggests that any model not on the EPA's preferred list is scientifically unreliable. The EPA guideline is "[a]pplicable only to criteria air pollutants" and "is not intended to be a compendium of modeling techniques." *Id.* § 1.0(a). The liquid droplets in white rain are not a criteria air pollutant, and Petersen admitted that AERMOD does not model evaporation of wet droplets. (Petersen Dep. 85:12–25, Mar. 27, 2013, ECF No. 175-3.) Since the these cases do not directly involve regulatory action and since AERMOD is less appropriate for measuring wet droplets than criteria air pollutants, the EPA guideline does not justify the exclusion of AGDISP as scientifically unreliable.

AGDISP has a number of limitations that affect its ability to model the white rain in these cases. The maximum release height that can be entered in the AGDISP model is 500 feet, but the two stacks at Bruce Mansfield are 600 feet and 950 feet tall. (Hr'g Tr. 23:8–17, Jan. 14, 2014, ECF No. 276.) AGDISP does not account for plume rise. (*Id.* at 2:25–3:4.) Drivas testified that the effect of these limitations is to underestimate evaporation and overestimate deposition. (*Id.* 23:18–24:7.) Because the droplets are actually released above 500 feet, compared to the model they take longer to settle to the ground, giving them more time to evaporate. (*Id.*) The AGDISP model is not validated to predict accurately deposition more than one-half mile of the source. (Hr'g Tr. 224:22–225:7, Jan. 13, 2014, ECF No. 275.) Drivas determined that this limitation did not affect the accuracy of the model because any droplets still aloft a half mile from Bruce Mansfield evaporate quickly and there is no further deposition. (*Id.* 227:13–16; Drivas Rep. No. 4, at 10 tbl.4.1, ECF No. 232-1.)

Drivas had "good grounds" for selecting and applying the AGDISP model. Unlike AERMOD, AGDISP can measure evaporation and accounts for the effect of humidity, one of the important variables to consider with liquid droplets. (Hr'g Tr. 24:10–15, Jan. 14, 2014, ECF No. 276.) Drivas adequately considered the limitations inherent in the AGDISP model as applied to the white rain situation and had logical grounds for concluding that the limitations did not affect the accuracy of the model.

These limitations are therefore a matter of the weight to be afforded to Drivas's testimony. Drivas's opinions based upon the AGDISP model meet the reliability threshold of *Daubert* and Rule 702.

Neither AGDISP nor AERMOD are perfectly adapted to modeling the white rain situation at issue in these cases. Each model has strengths and weaknesses. Deciding which, if either, of these models provides an accurate representation of white rain deposition is not the province of the court. *In re TMI Litig.*, 193 F.3d at 682 (finding that dispute between two competing scientific theories goes to weight, not reliability). Plaintiffs' motions to preclude testimony about AGDISP will be denied.

C. Defendant's Motions to Preclude the Expert Opinions of Cheremisinoff

Cheremisinoff is a chemical engineer and an expert in fluid dynamics. Cheremisinoff evaluated the white rain opinions of Petersen and Drivas and provided "an independent opinion on the methodology applied and overall reliability of the dispersion calculations performed." (Cheremisinoff Rep. 7, ECF No. 165-1.) Specifically, Cheremisinoff considered the effect of evaporation on the ability of AERMOD to predict accurately white rain deposition. (*Id.* at 1.) Cheremisinoff concluded that Petersen's overall analysis, which included AERMOD simulations with input data modified to account for evaporation, accurately simulated the white rain impact zone. (*Id.* at 4.) Cheremisinoff opined that Drivas unreasonably assumed very high evaporation rates and very low wind speeds in order to manipulate the analysis and return misleading results. (*Id.* at 5.) Defendant challenges the reliability and fit of these opinions. Because Cheremisinoff's opinions are unnecessarily cumulative and would not help the trier of fact, defendant's motions to preclude his expert testimony will be granted.

Cheremisinoff's evaluation of Petersen's white rain opinions amounts to vouching for Petersen and is cumulative to Petersen's testimony. Cheremisinoff is not an air modeler. (Hr'g Tr. 77:1, Jan. 14, 2014, ECF No. 276.) Plaintiffs admit that Cheremisinoff did not closely examine the modeling files of Petersen or Drivas. (*Id.* at

78:6–8.) Instead, he only read the expert reports of Petersen and Drivas and evaluated their work "from the macro perspective." (*Id.* at 78:8–9.) Cheremisinoff concluded that AERMOD accurately predicts the deposition of white rain and that Petersen's analysis is "reasonable," "logical," and "sophisticated." (Cheremisinoff Rep. 4–5, 7, ECF No. 165-1.) He reviewed Petersen's work and found it convincing, but he performed no independent air modeling analysis.

Plaintiffs argue that Cheremisinoff's testimony would be helpful to the jury and not unduly cumulative because he evaluated Petersen's work from the standpoint of chemistry and flow dynamics, expertise that Petersen does not have. (Hr'g Tr. 84:18–85:23, Jan. 14, 2014, ECF No. 276.) Despite Cheremisinoff's different scientific expertise, the testimony is nevertheless cumulative. In *Tunis Brothers Co. v. Ford Motor Co.*, 124 F.R.D. 95 (E.D. Pa. 1989), the plaintiff sought to present a second damages expert. The plaintiff argued that this expert would "not introduce any 'new' testimony but will simply present his interpretation of [the original expert's] calculations from the perspective of an economist rather than an accountant." *Id.* at 97. The court precluded the second expert's testimony. *Id.* ("Merely to have partisan experts appear to vouch for previous experts violates Fed. R. Evid. 403 and would needlessly present cumulative evidence, waste time, and mislead the jury."). The same reasoning applies to the instant case.

Cheremisinoff's rebuttal to the opinions of Drivas also would be unhelpful to the trier of fact. This testimony, specifically the discussion of nucleation and agglomeration, is not cumulative to Petersen's rebuttal opinions. Attacking Drivas for not considering nucleation and agglomeration could mislead the jury, however, because those mechanisms are very complex and Petersen's analysis did not consider their effect either. (Cheremisinoff Dep. 74:19–77:25, May 3, 2013, ECF No. 165-7.)

Cheremisinoff also offered opinions about the credibility of Drivas. (*See, e.g.*, Cheremisinoff Rep. 22, ECF No. 165-1 ("These observations demonstrate that Drivas has manipulated his analysis in order to mislead."); *id* at 24 ("The analysis Drivas

performed is biased.).) Expert opinion about the credibility of other witnesses generally is not helpful as it undermines the jury's credibility-finding function. *Coney v. NPR, Inc.*, 312 F. App'x 469, 474 (3d Cir. 2009) ("'[T]he credibility of witnesses is generally not an appropriate subject for expert testimony.'" (quoting *United States v. Adams*, 271 F.3d 1236, 1245 (10th Cir. 2001)); 29 Charles Alan Wright & Victor James Gold, Federal Practice and Procedure § 6264 (1997) ("[C]ourts generally exclude expert opinion as to whether a witness is or is not telling the truth.").

Since Cheremisinoff's expert testimony would not assist the trier of fact and would be unduly cumulative or duplicative, the court will grant defendant's motions.

IV. Conclusion

For the reasons set forth above, the motions to strike Petersen's 2014 supplemental expert report will be denied. The motions to exclude the expert testimony of Petersen and Drivas will be denied. The motions to exclude the expert testimony of Cheremisinoff will be granted. Appropriate orders will be entered.

Dated: March 17, 2014

By the court:

/s/ Joy Flowers Conti
Joy Flowers Conti
Chief United States District Judge